

Neither Germany nor Japan “Almost Built” an Atomic Bomb

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Methods of Building an Atomic Bomb

The fissionable material required for a thermonuclear bomb can come from only two sources: plutonium, or U (uranium)-235. Production of plutonium in quantities sufficient to build an atomic bomb requires the use of a nuclear reactor. Since everyone agrees that Germany and Japan did not have a functioning nuclear reactor during World War II, the only possible way Germany or Japan could have produced an atomic bomb would have been through the use of U-235.

The separation of U-235 from the uranium (U-238) found as ore proved to be an enormously complex and expensive process because of the similarity in density of U-235 versus U-238 (a difference barely over 1 percent). Niels Bohr, the great Danish physicist, stated in 1939 that the whole of the United States would have to be transformed into a factory in order to produce the fissionable enriched U-235 required for a bomb.[\[4\]](#) Indeed, the American atomic-bomb program, known as the Manhattan Project, was a gigantic industrial and engineering construction effort that used enormous resources such as were not available to Germany or Japan during World War II.[\[5\]](#)

American Efforts in Producing U-235

Gen. Leslie R. Groves, the head of the Manhattan Project, purchased 59,000 acres of Appalachian land in Tennessee in September 1942 to construct the factories to produce fissionable U-235. To build these factories, the U.S. Army had to first improve communications and build a town. Contractors cut 55 miles of rail roadbed and 300 miles of paved roads and streets, while improving the important county roads to four-lane highways. The newly constructed town of Oak Ridge, initially planned for 13,000 workers, was fenced with barbed wire and controlled through seven guarded gates.[\[6\]](#)

When Gen. Groves first met with a group of scientists in October 1942, he told them that the atomic-bomb project was of utmost importance to the War Department. Groves told the scientists that time was more important than money. If there was a choice between two methods to generate U-235, then use them both. A wrong decision that brought some results was far better than no decision at all.[\[7\]](#)

The Manhattan Project was plagued by massive imponderables. Gen. Groves in October 1942 asked a group of physicists: With respect to the amount of fissionable material needed for each bomb, how accurate did the scientists think their estimate was? Groves demanded an answer correct within 25%, but got one which the physicists steadfastly admitted might be off by a factor of 10. This was in fact an underestimate, since calculations regarding the critical mass had so far varied by a factor of 100.[\[8\]](#)

Gen. Groves wrote with regard to this variance in the estimate of fissionable material needed for an atomic bomb:

This meant, for example, that if they estimated that we would need 100 pounds of plutonium for a bomb, the correct amount could be anywhere from 10 to 1,000 pounds. Most important of all, it completely destroyed any thought of reasonable planning for the production plants for fissionable materials. My position could well be compared to that of a caterer who is told he must be prepared to

serve anywhere between 10 and 1,000 guests. But after extensive discussion on this point, I concluded that it simply was not possible then to arrive at a more precise answer.[\[9\]](#)

The plants designed to develop the fissionable U-235 from the U-238 were built at Oak Ridge, Tennessee. The construction of plants using the electromagnetic process and the gaseous-diffusion process were authorized late in 1942, and a thermal-diffusion-process plant was also built in 1944. A full discussion of the Oak Ridge plants and the research and theory behind them is beyond the scope of this article. Suffice it to say that construction of these plants was enormously difficult and costly, with no guarantee of success of any of the processes.[\[10\]](#)

The Manhattan Project proved to be more-difficult and -expensive than anyone had foreseen. It is estimated that the Oak Ridge plants alone consumed approximately one-seventh of the electricity then generated in the United States.[\[11\]](#) The Manhattan Project faced major challenges in procuring such large amounts of electricity from a wartime economy that was only beginning to overcome chronic shortages.[\[12\]](#)

The Manhattan Project was also unique in its manpower requirements and problems. The Manhattan Project employed nearly 129,000 people in its various operations at its peak in June 1944. This figure included contractor employment of 84,500 construction workers and 40,500 operating employees. In addition, there were slightly fewer than 1,800 military personnel assigned to the project, and an equal number of civil-service employees.[\[13\]](#) The cost of the Manhattan Project reached the then-staggering sum of \$2 billion by the end of World War II.[\[14\]](#)

As massive as they were, the installations at Oak Ridge and at Hanford, Washington were but a part of the full operation of the Manhattan Project. By 1945 there were factories, laboratories and mines in 39 states as well as Canada and Africa supporting the operations at Oak Ridge and Hanford.[\[15\]](#) This enormous operation allowed the United States to successfully construct two atomic bombs by July 1945. While construction of the atomic bomb could have easily taken longer, it is hard to imagine how this feat could have been accomplished more quickly.[\[16\]](#)

German Efforts to Construct an Atomic Bomb

German physicists investigated the feasibility of developing an atomic bomb. They got far enough to realize that the separation of uranium isotopes would require an enormous industrial effort, and they concluded that such a major industrial effort was not practicable in wartime Germany.[\[17\]](#)

On June 4, 1942, senior German physicists met with Albert Speer, the minister of supply, and other government and military officials. Werner Heisenberg spoke openly about the possibility of building an atomic bomb capable of destroying an entire city. Albert Speer was impressed, but unable to act on Heisenberg's report. Adolf Hitler had recently proclaimed a policy to the effect that no new weapons project could be embarked upon unless results were guaranteed within six months. Since German scientists predicted that it would be several years before an atomic bomb could be built, Speer had to scale down the atomic-bomb program.[\[18\]](#)

British historian and economist Adam Tooze states in regard to the German atomic-bomb program:

After months of organizational argument, in the summer of 1942 the physicists made a major presentation to an audience including Albert Speer. All present were impressed with the extraordinary

potential of the scheme, but, when pressed, Werner Heisenberg and his colleagues confirmed [Gen.] Fromm's view that an atomic bomb was a long-term proposition. The project would come to fruition in two or three years' time at the earliest and would require a huge investment. Given Germany's situation in 1941 that made it an irrelevance. What the leadership of the Third Reich was looking for was a decisive success on the Eastern Front in the coming summer. [19]

After the war ten German scientists were detained in England for six months in a house named Farm Hall. Their conversations were secretly recorded by hidden microphones. Kurt Diebner explained why it was difficult to get approval for the atomic-bomb program: "Because the official people were only interested in immediate results. They didn't want to work on a long-term policy as America did." [20]

Max von Laue, a Nobel-laureate physicist interned in Farm Hall, wrote a letter to his son on August 7, 1945 explaining why Germany never built an atomic bomb:

The main question naturally, is why we did not arrive at the bomb in Germany. There is this to say: 1) the German physicists would never have received the means which England and America made available to their scientists for this purpose. Neither the work force nor the money would have been obtainable in anything approaching such quantities. For this reason alone, no physicist seriously considered requesting such means. That the increasingly severe, continuous bombardment of all cities would have been a further obstacle is proven by Churchill's statement that the production of the atomic bomb was not located in England due to the danger of air raids. 2) Our entire uranium research was directed toward the creation of a uranium machine as a source of energy...because no one believed in the possibility of a bomb in the foreseeable future... [21]

Werner Heisenberg, Germany's leading theoretical physicist, also stated that building an atomic bomb was an industrial problem far beyond Germany's capabilities during World War II. [22] None of the other German scientists interned in Farm Hall ever mentioned anything about Germany almost building an atomic bomb during the war. Since the German scientists at Farm Hall did not know their conversations were being recorded, it is inconceivable that such discussions would not have taken place if Germany was close to building an atomic bomb. [23]

The Alsos Mission was a team of United States military, scientific and intelligence personnel organized to discover German progress in building an atomic bomb. Samuel Goudsmit was the chief scientific advisor to the Alsos Mission. Goudsmit soon realized that the German atomic- bomb project was a small, poorly funded, part-time research project not past Square One. [24] Goudsmit commented: "Sometimes we wondered if our government had not spent more money on our intelligence mission than the Germans spent on their whole project." [25]

Matt Easley concludes: "Simply put, Germany was incapable of developing an atomic bomb during World War II. They did not have the people. They did not have the cooperation among the people they did have. They did not have the money. They did not have the laboratory or factory space. Lastly, late in the war, they did not have the power to prevent the Allies from destroying what they did have...The industrial and scientific capability of Germany was insufficient for the scope of this project." [26]

Japanese Efforts to Construct an Atomic Bomb

US intelligence always knew that Japan did not have the capability of building an atomic bomb during the war. Gen. Leslie Groves wrote regarding the Japanese atomic-bomb program:

We did not make any appreciable effort during the war to secure information on atomic developments in Japan. First, and most important, there was not even the remotest possibility that Japan had enough uranium or uranium ore to produce the necessary materials for a nuclear weapon. Also the industrial effort that would be required far exceeded what Japan was capable of. Then, too, discussions with our atomic physicists at Berkeley, who knew the leading Japanese atomic physicists personally, led us to the conclusion that their qualified people were altogether too few in number for them to produce an effective weapon in the foreseeable future. [27]

Conclusion

The United States was the only country in the world with the industrial and technical resources necessary to build an atomic bomb during World War II. There is no credible evidence that any other nation produced plutonium or U-235 in sufficient quantities during the war to build an atomic bomb. While it is possible that some other nations might have built a type of radioactive “dirty bomb”, for technical reasons these could not have involved either fission or fusion nuclear reactions. [28]

Journalist Annie Jacobsen speculates that Germany did not build an atomic bomb because Adolf Hitler regarded atomic physics as Jewish science. [29] However, this is not the reason why Germany didn't build an atomic bomb. Germany did not have the time, people and resources to complete such a mammoth project, and could not have built an atomic bomb no matter how Hitler felt about atomic physics.

Werner Heisenberg had made wildly inflated estimates of the amount of U-235 needed to build an atomic bomb at the time he first learned in Farm Hall that the United States had dropped an atomic bomb on Hiroshima. [30] Some historians claim this is the reason why Germany did not build an atomic bomb. [31] However, in a thought-to-be-private conversation in Farm Hall with German chemist Otto Hahn, Heisenberg said that he had never worked out the calculation, since Germany had no means of obtaining pure U-235. [32] Germany could not, he concluded, have built an atomic bomb even if its scientists had known exactly how much U-235 was needed to build one.

Finally, Thomas Powers in his well-researched book *Heisenberg's War*, implies that Werner Heisenberg intentionally sabotaged the German atomic-bomb project. Powers writes:

The Farm Hall transcripts offer strong evidence that Heisenberg never explained fast fission to Gerlach, that he cooked up a plausible method of estimating critical mass which gave an answer in tons, and that he well knew how to make a bomb with far less, but kept the knowledge to himself. Small wonder that with such an adviser the German authorities concluded that a bomb was beyond them. [33]

While it is true that Heisenberg had never wanted to build an atomic bomb, it is not true that he intentionally sabotaged the German atomic-bomb project. As documented in this article, Germany would not seem during the war to have had sufficient resources to complete such a mammoth project.

Notes

[1] For example, see Farrell, Joseph P., *Reich of the Black Sun: Nazi Secret Weapons and the Cold War Legend*, Ill., Adventures Unlimited Press, 2004; Karlsch, Ranier, *Hitler's Bomb: The Secret History of German Nuclear Weapons Research*, Munich, Germany: Deutsche Verlags-Anstalt, 2005.

- [2] Hydrick, Carter, *Critical Mass: How Nazi Germany Surrendered Enriched Uranium for the United States Bomb*, 2nd edition, Whitehurst & Co., 2004.
- [3] Wilcox, Robert J., *Japan's Secret War: Japan's Race against Time to Build Its Own Atomic Bomb*, New York: William Morrow and Company, Inc., 1985.
- [4] Cornwell, John, *Hitler's Scientists: Science, War and the Devil's Pact*, New York: Penguin Books, 2003, p. 299.
- [5] Norris, Robert S., *Racing for the Bomb: General Leslie R. Groves, The Manhattan Project's Indispensable Man*, South Royalton, Vt.: Steerforth Press, 2002, p. 187.
- [6] Rhodes, Richard, *The Making of the Atomic Bomb*, 25th Anniversary Edition, New York: Simon & Schuster, 2012, pp. 486-487.
- [7] Norris, Robert S., *Racing for the Bomb: General Leslie R. Groves, The Manhattan Project's Indispensable Man*, South Royalton, Vt.: Steerforth Press, 2002, pp. 231-232.
- [8] DeGroot, Gerard J., *The Bomb: A Life*, Cambridge, Mass.: Harvard University Press, 2004, p. 35.
- [9] Groves, Leslie R., *Now It Can Be Told: The Story of the Manhattan Project*, New York: Harper & Row, 1962, p. 40.
- [10] *Ibid.*, p. 94.
- [11] Farmelo, Graham, *Churchill's Bomb: How the United States Overtook Britain in the First Nuclear Arms Race*, New York: Basic Books, 2013, p. 255.
- [12] Jones, Vincent C., *Manhattan: The Army and the Atomic Bomb*, Washington, D.C.: Center of Military History United States Army, 1985, p. 377.
- [13] *Ibid.*, p. 344.
- [14] Jungk, Robert, *Brighter Than a Thousand Suns*, New York: Harcourt, Brace & World, Inc., 1958, p. 177.
- [15] Norris, Robert S., *Racing for the Bomb: General Leslie R. Groves, The Manhattan Project's Indispensable Man*, South Royalton, Vt.: Steerforth Press, 2002, pp. 226-227.
- [16] *Ibid.*, p. 376.
- [17] Bernstein, Jeremy, *Hitler's Uranium Club: The Secret Recordings at Farm Hall*, 2nd edition, New York: Copernicus Books, 2001, p. 334.
- [18] DeGroot, Gerard J., *The Bomb: A Life*, Cambridge, Mass.: Harvard University Press, 2004, p. 31.
- [19] Tooze, Adam, *The Wages of Destruction: The Making and Breaking of the Nazi Economy*, New York: Penguin Books, 2006, p. 510.
- [20] Bernstein, Jeremy, *Hitler's Uranium Club: The Secret Recordings at Farm Hall*, 2nd edition, New York: Copernicus Books, 2001, p. 123.

- [21] Beyerchen, Alan D., *Scientists under Hitler: Politics and the Physics Community in the Third Reich*, New Haven, Conn.: Yale University Press, 1979, p. 197.
- [22] Walker, Mark, *Nazi Science: Myth, Truth, and the German Atomic Bomb*, New York: Plenum Press, 1995, p. 225.
- [23] Bernstein, Jeremy, *Hitler's Uranium Club: The Secret Recordings at Farm Hall*, 2nd edition, New York: Copernicus Books, 2001, p. 78.
- [24] Powers, Thomas, *Heisenberg's War: The Secret History of the German Bomb*, New York: Alfred A. Knopf, 1993, p. 369.
- [25] Bernstein, Jeremy, *Hitler's Uranium Club: The Secret Recordings at Farm Hall*, 2nd edition, New York: Copernicus Books, 2001, p. 50.
- [26] <http://www.vanderbilt.edu/AnS/physics/brau/H182/Term%20papers%20'02/Matt%20E.htm>.
- [27] Groves, Leslie R., *Now It Can Be Told: The Story of the Manhattan Project*, New York: Harper & Row, 1962, p. 187.
- [28] Cassidy, David C., *Beyond Uncertainty: Heisenberg, Quantum Physics, and the Bomb*, New York: Bellevue Literary Press, 2010, p. 303.
- [29] <https://www.youtube.com/watch?v=HHs5M3pyd3Q>.
- [30] Bernstein, Jeremy, *Hitler's Uranium Club: The Secret Recordings at Farm Hall*, 2nd edition, New York: Copernicus Books, 2001, p. 117.
- [31] For example, see Rose, Paul Lawrence, *Heisenberg and the Nazi Atomic Bomb Project: A Study in German Culture*, Berkeley, Cal.: University of California Press, 1998, p. 77.
- [32] Bernstein, Jeremy, *Hitler's Uranium Club: The Secret Recordings at Farm Hall*, 2nd edition, New York: Copernicus Books, 2001, p. 128.
- [33] Powers, Thomas, *Heisenberg's War: The Secret History of the German Bomb*, New York: Alfred A. Knopf, 1993, p. 452.

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